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U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF PLANT INDUSTRY—BULLETIN NO. 33.

B. T. GALLOWAY, Chief of Bureau.

NORTH AMERICAN SPECIES OF LEPTOCHLOA.

BY

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GRASS AND FORAGE PLANT INVESTIGATIONS.

Issued February 10, 1903.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1903.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., October 18, 1902.

SIR: I have the honor to transmit herewith a technical paper entitled "North American Species of Leptochloa," and respectfully recommend that it be published as Bulletin No. 33 of the series of this Bureau.

This paper was prepared by Mr. A. S. Hitchcock, Assistant Agrostologist, in Charge of Cooperative Experiments, Grass and Forage Plant Investigations, and has been submitted by the Agrostologist with a view to publication.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

PREFACE.

There is much confusion in the names applied to our North American grasses. This is partly due to the fact that much new material has been collected since the revision of some of the important genera. The practice, formerly more prevalent than at present, of erecting new species on the basis of a single specimen or of a very few specimens at most, has added to this confusion. The economic importance which the grasses have assumed in the last two decades has made this confusion all the more embarrassing. It therefore seems desirable that the bibliography, synonymy, and systematic relationships of American grasses be worked out as rapidly as possible. The present paper by Professor Hitchcock is an attempt to do this for the genus *Leptochloa*. It is based chiefly upon the material in the herbarium of the U. S. National Museum and that of the U. S. Department of Agriculture, but all the important public herbaria in this country were consulted during its preparation. The descriptions of the species are diagnostic rather than complete, but it is hoped that these will serve the purpose of students of systematic botany. Much time has been spent in working out the proper relationship of the species and it is hoped that the short descriptions, the text figures illustrating the spikelets of each species, the plates taken from herbarium specimens of several species, and the key to our United States species will take the place of more complete descriptions and render this paper valuable to students of this genus.

The species of *Leptochloa* are inhabitants of the warmer regions, only one or two of our species extending as far north as New York and Illinois. One of the species, *Leptochloa dubia*, called sprangle, is an important range grass in the Southwest, and recent experiments indicate that it will prove a desirable grass for cultivating in semiarid regions.

W. J. SPILLMAN,
Agrostologist.

OFFICE OF THE AGROSTOLOGIST,
Washington, D. C., October 14, 1902.

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NORTH AMERICAN SPECIES OF LEPTOCHLOA.

INTRODUCTION.

In presenting the following review of the genus Leptochloa I have been able to bring together our knowledge of this group of grasses without describing any new species. In regard to the latter, botanists will probably be thankful. But, on the other hand, I have been constrained in several cases to unite species kept separate by others. All will not agree with me in the course I have taken in this respect. It is always difficult to decide where specific lines shall be drawn, but I have been governed by this rule: When two or more forms are connected by numerous intergrading specimens they are to be considered as the same species, although typical specimens of the extreme forms may be easily distinguished.

The notes are based mainly upon the Herbarium of the U. S. Department of Agriculture, but through the kindness of those in charge I have had the opportunity to examine the collections at the Missouri Botanical Garden, the Gray Herbarium, the New York Botanical Garden, and the Philadelphia Academy of Natural Science. I have also examined the specimens in the larger European herbaria, to the directors of which I wish to express my thanks for the privilege.

For the purpose of this paper it seemed not worth while to enumerate all the specimens examined, but a number of representative specimens from numbered sets have been indicated for easier reference.

KEY TO SPECIES OF THE UNITED STATES.

1. Spikelets usually short-pediceled (sessile in *L. spicata*, but flowers several), arranged somewhat distantly along the branches of the panicle, not so conspicuously one-sided as in the following group; 4 to several flowered (2-flowered in some forms of *L. dubia*) 2
1. Spikelets nearly sessile in two or more rows on one side of the branches of the panicle, 2 to 4 flowered and usually closely imbricated (more distant in *L. mucronata*) 7
2. Panicle simple or often reduced to a single branch or spike ..... spicata.
2. Panicle compound 3
3. Spikelets 4 (2) to 6 flowered 4
3. Spikelets many flowered, elongated 6

4. Flowering glume broad, truncate and more or less emarginate; sometimes slightly awned from the protrusion of the mid-nerve ..... **dubia.**
4. Flowering glume rounded at apex and short-awned or mucronate 5
5. Panicle 2 to 3 inches long. Plant with numerous culms, a few inches to a foot high; leaves 3 or 4 inches long ..... **viscida.**
5. Panicle larger, culms 2 to 3 feet tall, leaves a foot or more long .. **floribunda.**
6. Flowering glume awned ..... **fascicularis.**
6. Flowering glume awnless or mucronate ..... **imbricata.**
7. Spikelets usually 2-flowered, sometimes 3 or even 4 flowered, 1 to 2 mm. long, branches of panicle very slender, upper empty glume as long as or longer than the first flowering glume, latter obtuse ..... **mucronata.**
7. Spikelets usually 3 to 4 flowered, rather closely imbricated, spikes shorter and close set on the axis, forming a narrow panicle; empty glumes shorter than the first flowering glume 8
8. Sheaths scabrous, glumes sharp-pointed ..... **scabra.**
8. Sheaths smooth; flowering glumes rounded or truncate at apex 9
9. Sheath ciliate on margin above; flowering glume more or less awned. **domingensis.**
9. Sheath not ciliate; flowering glume awnless ..... **nealleyi.**

HISTORY OF GENUS.

The genus Leptochloa was established by Palisot de Beauvois.[a] To his new genus he refers *Cynosurus capillaceus*, *Eleusine filiformis*, and *E. virgata*. The last of these species is figured[b] and in the description[c] of plates he uses the name *Leptochloa virgata*. It may be inferred that he intends to make the new combination for the other two species, as in the index, page 166, he indents under Leptochloa the three names, *capillacea*, *filiformis*, and *virgata*. It may be remarked that if one intends to be very accurate in regard to citations these three species of Leptochloa should be referred to page 166 (the index) rather than page 71 in the body of the work, where the genus is described. The same remark would apply to the most of Beauvois's species.

Beauvois also established the genera *Diplachne*,[d] to which he refers *Festuca fascicularis* Lam., and *Rabdochloa*,[e] to which he refers *Cynosurus monostachyos*, *virgatus*, *domingensis*, *cruciatus?*, *mucronatus?*.

Kuntze substitutes Rabdochloa for Leptochloa because Beauvois assigns five species to the former and only three to the latter.

Professor Scribner unites these under the genus *Leptochloa*.[f] Professor Gray also placed *Diplachne* under *Leptochloa* as a section.[g] Nuttall[h] proposed the genus *Oxydenia* to include *O. attenuata* (*Eleusine mucronata*).

I have accepted the genus as delimited by Scribner, U. S. D. A. Div. Agros. Bul. 20:110. Our species all are annuals except *L. dubia*.

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[a] Essai d'une nouvelle Agrostographie, 71. 1812.
[b] l. c., Atlas, pl. xv, fig. 1.
[c] l. c., Atlas, 10.
[d] l. c., 80.
[e] l. c., p. 84.
[f] Proc. Acad. Phil., **1891**: 303.
[g] Man., Ed. I, 588.
[h] Gen. **1**: 76, 1818.

NORTH AMERICAN SPECIES.

A.—LEPTOCHLOA *proper. Spikelets 2 to 4 flowered, arranged close together on one side of the branches of the panicle.*

LEPTOCHLOA MUCRONATA Kunth. Rev. Gram. **1**: 91. 1835. Transfers *Eleusine mucronata* Michx. (Pl. I. fig. 1; text fig. 2.)

Eleusine mucronata Michx. Fl. **1**: 65. 1803. "Hab. in cultis Illinoensibus."

Festuca filiformis Lam. Ill. **1**: 191. n. 1044. 1791. "Ex Amer. Merid. Comm. D. Richard."

Eleusine filiformis Pers. Syn. **1**: 87. 1805. "Hab. in Americ. meridion."

Eleusine sparsa Muhl. Descr. Gram. 135, 1817. "Habitat in Carolina et Georgia."

Oxydenia attenuata Nutt. Gen. **1**: 76. 1818. "On the banks of the Mississippi near New Orleans." Mr. Nuttall says: "To this genus belongs the *Eleusine filiformis* of Persoon, growing in the tropical regions of America, nearly allied to the present species." and is often quoted as the author of *Oxydenia filiformis*, but he does not make this combination.

Leptochloa filiformis Beauv. Agros. 71 and 166, 1812. Transfers *Eleusine filiformis* Pers. Roemer and Schultes (**2**: 580. 1817), also transfer *Eleusine filiformis* Pers. Presl. Rel. Haenk. **1**: 288. 1830, gives as the locality "Hab. in Mexico, ad Sorzogon Luzoniae." In the herbarium of the U. S. Department of Agriculture are several specimens from India. I am unable to distinguish these from the American plant. Hooker includes these under *L. filiformis* R. & S. (Flora Br. India, **22**: 298. 1896.) I have examined the Asiatic material in European herbaria and feel satisfied that *L. mucronata* occurs in southern Asia. It can be distinguished from the allied *L. chinensis* by the papillose sheaths.

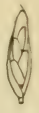

FIG. 1.—*L. attenuata.*

FIG. 2.—*L. mucronata.*

Eleusine elongata Willd. ex. Steud. Nom. ed. 2, **1**: 549, 1840. Labelled "Habitat in America meridionalis Humboldt." Types of this and the next examined in herbarium Willdenow.

Eleusine stricta Willd. l. c. Labelled "Habitat in San Domingo."

Leptochloa attenuata Steud. Syn. 209. 1855. Transfers *Oxydenia attenuata* Nutt. This is kept separate by Mr. Nash in Britton's manual, but the characters do not seem to me to be sufficiently constant for separation. This form is represented by Bush, Nos. 590, 403, 792, 793, and Eggert, 219a, from Missouri, and Palmer, 392, 401, from Indian Territory.

Leptochloa pellucidula Steud. l. c. "Duchaissing legit in Panama."

Leptochloa pilosa Scribn. U. S. D. A., Div. Agros. Cir. **32**: 9. 1901. "Type specimen collected in sandy soil, Dappan, Travis County, Tex., 294, J. E. Bodin, September, 1891." Professor Scribner states that "This species is closely related to *Leptochloa mucronata*, but it is at once distinguished by its rigid leaves and papillate-pilose sheaths." The leaves are somewhat more rigid than is usual in this species, but the papillate-pillose sheaths are found commonly in *L. mucronata*.

Stems tufted 6 to 10 dm. high, erect or occasionally more or less decumbent at base and rooting at the nodes. Leaves numerous, flat and rather soft, varying from 1 to 3 or more dm. in length and as much as ½ cm. wide. Sheaths more or less pilose from a papillate base. Panicle often 3 dm. or more in length, consisting of numerous slender spikes, arranged along a central axis;

spikes usually 8 to 15 cm. long. Spikelets 3 to 4 flowered, 1 to 2 mm. long, rather distant on the axis, that is, scarcely overlapping. Empty glumes about equal, lanceolate, acute or acuminate, nearly as long as the spikelet, or sometimes longer, lower slightly narrower. Flowering glumes thin, awnless, smooth or somewhat pilose on the nerves.

The form separated as *L. attenuata* has large panicles, with acuminate empty glumes and flowering glumes pilose on nerves.

DISTRIBUTION.—*Virginia to Florida and west to California:* Hall, 777, 778; Wright; 765; Bush, 468, 590; Curtiss, 5998; Coulter, 785; Lindheimer, 212. *Mexico:* Palmer, 248, 22, 694, 749, 1364, 117, 50 (in part); Rose, 1542; Schott, 739, 590. *Yucatan:* Gaumer, 853. *Cuba:* Wright, 740 (in part), 741 (in part). *Porto Rico:* Sintenis, 3550.

Var. **PULCHELLA** Scribn. Bull. Torr. Bot. Club, **9**: 147. 1882. "Santa Cruz Valley, near Tucson."

DISTRIBUTION.—*Texas to Arizona:* Heller, 1884; Hall, 777, 778; Coues & Palmer, 511; Jones, 4176. *Mexico:* Palmer, 50 (in part), 50½, 694, 8; Wright, 1316. Differs from the type in the short branches of the panicle, 2–3 cm. long, and the short narrow leaves.

LEPTOCHLOA VIRGATA Beauv. Agrost., 166; Atlas, p. 10. 1812. Refers *Eleusine virgata* to his new genus *Leptochloa* (l. c. p. 71). (Fig. 3.)

FIG. 3.—*L. virgata*, from St. Croix.

Cynosurus virgatus L. Syst. Nat., Ed. X: 1759. No locality is given, but he refers to Sloan jam., t. 70., f. 2, which is probably this species. In Spec. Pl., Ed. 2, the locality is "Habitat in Jamaica." See Munro, "The Grasses of Linnæus's Herbarium," Proc. Linn. Soc. Bot. **6**: 33–35. 1862. Linnæus mentions that the lower flowers are subaristate.

Festuca virgata Lam. Ill. **1**: 189. 1791. "Ex ins. Domingi." States that the spikelets are aristate and "floscul. ultimis submuticis."

Eleusine virgata Pers. Syn. **1**: 87. 1805. Description taken from Lamarck, l. c.

Oxydenia virgata Nutt. Gen. **1**: 76. 1818. This is the citation often given, but is an error, as Nuttall merely says, "To this genus belongs *Eleusine filiformis* of Persoon . . . and we may probably add the *Eleusine virgata* of Jamaica."

Chloris polystachya Lag. Nov. Gen. **4**. 1816. The short description scarcely suffices to determine this plant. "Spicis pluribus, patentibus: calycibus flosculisque glabris, muticis: culmo compresso. H. in N. H. unde semina missit D. Sesse."

Chloris pœformis H. B. K. **1**: 169. 1815. "Crescit in calidissimis humidis fluminis Magdalene prope Mompox: item prope Guayaquil et San Bowndon Quitensium." As synonyms are given *Cynosurus virgatus* L., *Eleusine virgata* Willd., and *Leptochloa virgata* Beauv., but a new specific name is applied because there is already a *Chloris virgata* Sw. In the description it is stated that the awn is very short.

Leptochloa procera Nees in Syll. Ratisb. **1**: 2. 1828. Type examined at Berlin.

Leptochloa digitaria Willd., ex Steud. Nom. Ed. 2. **1**: 549. 1840. Types of this and the next examined in herbarium Willdenow. Both specimens labelled "Habitat in America Meridionalis, Humboldt."

Leptochloa unioloides Willd., l. c.

Leptochloa mutica Steud. Syn. **1**: 208. 1854. "Surinam Am. Austr." Type examined.

DISTRIBUTION: *Ruatan Island:* Gaumer. *Mexico:* Liebmann 251, 252; Nelson 2768, 2483. *Cuba:* Rugel 193; Wright 3436, 740 (in part), 741 (in part); Combs 256. *Porto Rico:* Heller 4535; Sintenis 844. *Martinique:* Bourgeau 2375; Hahn 163. *St. Vincent:* Smith 577. *St. Croix:* Ricksecker 258. *St. Thomas:* Eggers 68. *Galapagos:* Anderson 44. *Brazil:* Riedel, Traill 1274. *Paraguay:* Morong 970.

LEPTOCHLOA DOMINGENSIS Trin. Fund. Agrost., 133. 1820. Transfers *Cynosurus domingensis* Jacq. (Pl. II, figs. 1, 2; text figs. 4, 5, 6.)

Cynosurus domingensis Jacq. Misc. **2**: 363, 1781. "Facie infra medium pilosa dorsa glabra."

Bromus capillaris Moench. Meth. 194, 1794. "Sub nomine Poae capillaris semina accepi," no locality given. Kunth refers this to *L. domingensis* (Enum. 1: 269) and the description applies, especially, "Folia lata infra glabra, supra deorsum scabra, basin versus pilosa," but Moench also says, "vaginæ glabræ." However, the pubescence is confined to the margin of the sheath.

Eleusine domingensis Pers. **1**: 87. 1805. "Hab. in Jamaica, St. Domingo."

Rabdochloa domingensis Beauv. Agrost. 176. 1812. Transfers *Cynosurus domingensis*, p. 84. He also refers *Poa domingensis* Pers. Syn. **1**: 88 to his genus *Rabdochloa*, and in this is followed by Kunth (l. c.).

FIG. 4.—*L. domingensis*, from Hidalgo, Tex.

FIG. 5.—*L. domingensis*, from Florida.

FIG. 6.—*L. domingensis*, from Central America.

Leptostachys domingensis Meyer. Esseq. 74. 1818. Transfers *Eleusine domingensis* Pers.

Leptochloa gracilis Nees. Syll. Ratisb., **1**: 4. 1824. Transfers *Chloris gracilis* H. B. K. See note under *L. dubia*. Nees in Agrost. Bras., 433. 1829, gives "Habitat in Brasiliis . . . (Sellow. Vidi in Herb. Reg. Berol.)"

Chloris gracilis H. B. K. Nov. Gen. **1**: 168. 1815. "Crescit in calidis Provinciæ Jaen de Biacamoros prope Tomependa, alt., 207 hex."

Leptostachys gracilis Meyer. Fl. Esseq., 74. 1818. Transfers *Chloris gracilis* to his new genus *Leptostachys*.

Our plants have the rigid, glaucous appearance of *L. virgata*, with involute leaves, but resemble *L. domingensis* in having the margin of the sheaths and the upper surface of the lower part of the blades ciliate or pilose. The awns are almost the length of the flowering glume. Grisebach distinguishes these by the length of the spikes and of the awns (Fl. Br. W. I.), thus, *L. virgata* with spikes 3–6 in. long and awns short or none; var. *gracilis*, awns about as long as glume, spikes 1½–2 in. long; var. *domingensis*, spikes 3–5 in. long and awns longer. The length of the awn can not be depended upon to distinguish these forms.

Stems ½ to 1 m. high, smooth and somewhat shining or glaucous, leaves long and narrowed to a slender point, involute; the tropical specimens have softer, flat leaves. Our specimens are probably introduced as the plant is not common within our borders. The drier climate would account for the involute leaves. The upper surface of blade near base is sparsely pilose with long weak hairs, the margin of the sheath is more densely ciliate. Panicles 1 to 2 dm. long

with numerous ascending branches 4 to 8 cm. The tropical specimens often have more ample panicles. Spikelets crowded, about 2 mm. long, 3 to 5-flowered. Empty glumes acute, lower narrow and shorter, about 1½ mm.; lower flowering glumes bear awns about their own length, upper with shorter awns or awnless.

DISTRIBUTION: *Florida along the coast south of Tampa*, Simpson. *Texas, Corpus Christi, and Hidalgo,*[a] Nealley. *South America and West Indies.*

LEPTOCHLOA NEALLEYI Vasey. Bull. Torr. Bot. Club, **12**: 7. 1885. "Collected in Texas by Mr. G. C. Nealley, for whom it is named."

Leptochloa stricta Fourn. Pl. Mex. **2**: 147. 1886. I have examined the type in Paris. "Vera Cruz (Gouin, n. 73)."

FIG. 7.—*L. nealleyi.*

Stems ½ to 1½ m. high, smooth. Leaves elongated or on the smaller plants only 5 to 10 cm. long, 3 to 5 mm. wide, involute, somewhat scabrous; sheaths smooth or very slightly scabrous. Panicles narrow, 2 to 4 dm. long, branches numerous, crowded, appressed, 2 to 6 cm. long. Spikelets crowded, about 2 to 3 mm. long, 3 to 4-flowered. First empty glume about one-half the length of the second and narrower; flowering glumes obtuse.

DISTRIBUTION: *Texas:* Nealley 2501; Bush 1363; Buckley, Drummond 291; Tracy 7368. This has the aspect of *L. scabra*, but the glumes are rounded at the apex, while in the latter they are acuminate or slightly awned. (Pl. III, fig. 2; text fig. 7.)

LEPTOCHLOA SCABRA Nees. Agrost. Bras. 435. 1829. "Habitat in ripa inundata fluminum Amazonum, Tagipuru et Tocantins, provinciæ Paraensis (Mart.)." Nees remarks that this differs from *L. virgata* in having the leaves and sheaths very scabrous and the small, whitish, slender spikelets entirely unawned. (Pl. III, fig. 1; text fig. 8.)

FIG. 8.—*L. scabra.*

L. langloisii Vasey. Bull. Torr. Bot. Club, **12**: 7. 1885. "This large and showy species was found in Louisiana by Rev. A. B. Langlois, for whom it is named."

Resembles *L. nealleyi* in habit. Differs in having distinctly scabrous sheaths; the branches of the panicle longer and more or less curved; the spikelets 3 mm. or more long, the glumes acute or acuminate. Our plants are probably introduced from further south.

DISTRIBUTION: *Louisiana:* In ditches and fields, Station Michaud, 13 miles from New Orleans, Langlois. *Brazil:* Rusby 235. *British Guiana:* Jenman 4441. *Costa Rica:* Tonduz 2604; Spruce 424.

[a] The specimen from Hidalgo (fig. 4) differs from the others in having the flowering glumes awnless. It is in an unsatisfactory condition, but may be *L. virgata*, Beauv.

B.—Intermediate between *Leptochloa* and *Diplachne*.

LEPTOCHLOA VISCIDA Beal. Grasses N. A. **2**: 434. 1896. Transfers *Diplachne viscida* Scribn. (Pl. I, fig. 2; text fig. 9.)

Diplachne viscida Scribn. Bull. Torr. Bot. Club, **10**: 30. 1883. "Santa Cruz Valley, near Tucson, Arizona." Collected by Pringle.

Growing in tufts in moist places, 1 to 3 dm. high. Leaves a few cm. long, 2 to 3 mm. wide. Panicle short, 1 to 4 cm. long, more or less enclosed in the sheaths. Spikelets 3 to 4 mm. long, 5 to 7-flowered. First glume about one-half the second, $\frac{2}{3}$ mm. long. Flowering glumes short awned, somewhat viscid on the back.

FIG. 9.—*L. viscida.*

DISTRIBUTION: *Arizona:* Pringle; Mearns 793, 833; Griffiths 1988. *New Mexico:* Wright 2041, 2044. *Mexico:* Pringle 814; Palmer 748, 748½, 692, 1789; Brandegee 5; Wright 1086.

LEPTOCHLOA DUBIA Nees in Syll. Ratisb. **1**: 4. 1824. In an article entitled "Novæ plantarum species in horto botanico Bonnensi cultæ," Nees ab Esenbeck, who signs the portion relating to *Leptochloa*, describes *L. procera*, and states that it differs from "*Leptochloa gracile*, Humb. et Kunth n. gen. et sp. I. p. 168 (sub chlori), vaginis glabris, valvulis corollinis nudis, nec ciliatis, apice integris, mucronatis, nec aristatis, flosculorum numero minore . . .

A Leptochloa (Chlori) dubia Humb. et Kunth l. c. p. 169; panicula aequali, nec subfastigiata, flosculorum numero minore, valvulis nudis, nec ciliatis . . ." He thus incidentally transfers these two species of *Chloris* to *Leptochloa*. (Fig. 10.)

FIG. 10.—*L. dubia.*

Chloris dubia H. B. K. Nov. Gen. **1**: 169. 1815. "Crescit in apricis subhumidis prope rupem porphyriticam el Penon, in convalle Mexicana, alt. 1168 hexap."

Leptostachys dubia Mey. Fl. Esseq. 74. 1818. Refers *Chloris dubia* doubtfully to *Leptostachys*.

Festuca obtusiflora Willd. in Spreng. Syst. **1**: 356. 1825. "Mexico." Type seen.

Uralepis brevispicata Buckley. Proc. Acad. Phil. **1862**: 93. 1863. "Northern Texas." I have examined Buckley's specimen in the herbarium of the Philadelphia Academy.

Diplachne dubia Scribn. Bull. Torr. Bot. Club. **10**: 30. 1883. Transferred to the genus *Diplachne*.

Leptochloa pringlei, Beal Grasses N. A. **2**: 436. 1896. "*D. pringlei* Vasey ined. Arizona, Pringle, 1884." In the Department herbarium is a specimen collected by Pringle in 1884 in Tucson (No. 13), which answers to the description given in Beal's Grasses, but seems to me to be a small form of *L. dubia*. This is figured in U. S. D. A. Div. Agrost. Bull. **7**: 224, fig. 218.

Diplachne dubia Pringleana O. K. Rev. Gen. Pl. **3**[2]: 348. 1898, transferred to *Leptochloa* by Scribner and Merrill, U. S. D. A. Div. Agrost. Bull. **24**: 27, 1901, is a robust variety from Chihuahua, Mexico (Pringle 422).

Stems 3 to 10 dm. high from a perennial root. Leaves long and narrow, tapering to a slender point as in *L. fascicularis* Gray, usually not over one-half cm. wide. Panicle, consisting of several or many more or less spreading spikes, 5 to 15 cm. long. Spikelets, 5 to 10 mm. long, 5 to 8 flowered, or in the smaller forms only 2-flowered. Empty glumes acute, upper 4 mm. long, lower a little shorter and narrower; flowering glumes broad and obtuse or emarginate at apex, the midrib sometimes extending into a short point. This species is readily distinguished by the broad, scarious emarginate apex of the flowering glumes. This is a valuable forage plant in the Southwest, where it is called "sprangle." Experiments indicate that it may prove valuable under cultivation in the arid regions of our Western States.

DISTRIBUTION: *Arizona:* Lemmon 368. *New Mexico:* Wooten 418. *Texas:* Jones 4210; Wright 767. *Florida:* Garber 33; Curtiss 3450; Simpson 302; Tracy 6453. *Mexico:* Palmer 270, 273, 530, 381, 482, 468; Bourgeau 533; Brandegee 6; Schaffner 671, 1079, 933; Pringle 422; Xantus 119; Botteri 690.

C.—DIPLACHNE. Spikelets several flowered, arranged more distantly on the branches of the panicle and not conspicuously one-sided.

LEPTOCHLOA FLORIBUNDA Doell in Mart. Fl. Bras. **2**[3]: 89. 1878. Type locality: "ad ripas fluminis Amazonum inter Manaos et Santarem (Spruce)." (Pl. VI, fig. 1; text fig. 11.)

Diplachne halei Nash. Bull. N. Y. Bot. Gard. **1**: 292. 1899. Type collected in Louisiana by Hale. Co-type in herbarium U. S. D. A.

FIG. 11.—*L. floribunda.*

Leptochloa halei Scribn. & Merr. U. S. D. A. Div. Agrost. Bull. **24**: 27. 1901. Transfers *Diplachne halei*. The relation of *L. halei* to *L. floribunda* is discussed in the article last cited. Going over the same evidence I believe that we are safe in making the present disposition.

Plant with the aspect of *L. fascicularis* Gray. Panicle oblong, rather compact, with numerous branches 4 to 6 cm. long. Spikelets 4 to 5 mm. long, 5 to 7 flowered. Empty glumes slightly unequal, upper about 2 mm., lower shorter. Flowering glumes with a very short point.

Probably introduced in the United States from farther south.

DISTRIBUTION: Texas to Brazil. *Key West:* Blodgett; *Mississippi:* Tracy 7451; *Louisiana:* Hale; *Texas:* Drummond 322; *Brazil:* Spruce 1112.

LEPTOCHLOA AQUATICA Scribn. & Merrill. U. S. D. A. Div. Agrost. Bull. 24: 26. 1901. "Type specimen collected in shallow water near Cuernavaca, State of Morelos, altitude 1700 m., C. G. Pringle, 6664 August 22, 1897." Resembles *L. floribunda*, but differs in having more unequal outer glumes, longer spikelets, with more distant flowers and obtuse flowering glumes. In *L. floribunda* the flowering glumes are distinctly short-awned. (Fig. 12.)

FIG. 12.—*L. aquatica.*

LEPTOCHLOA FASCICULARIS Gray. Man. Ed. 1. 588. 1848.

Festuca fascicularis Lam. Tabl. Enc. 1: 189. 1891. "Ex. Amer. merid. Comm. D. Richard." (Pl. IV, figs. 1, 2; Pl. V, fig. 1; text fig. 13.)

Bromus pœformis Spreng. Nach. Bot. Gart. Halle 15. 1801. Dr. Dammer, of the Royal Botanical Museum of Berlin, has kindly sent me a transcript of Sprengel's description. "*Bromus pœformis* mihi Pyrenæen." with reference to a footnote which says "*Poa digitata* Michaux. Sed est certissime *Bromus*, utut repugnet habitus: namque aristæ manifesto infra apicem glumæ oriuntur. Br. panicula erecta stricta composita, spicatis sex floris sub secundis, fol. longissimis involutis."

FIG. 13.—*L. fascicularis.*

Festuca polystachya Michx. Fl. 1: 66. 1803. "In arvis Illinoensibus." Type seen.

Diplachne fascicularis Beauv. Agrost. 80 and 160. Atlas, p. 11, pl. xvi, fig. 9. 1812. Made type of new genus without description of species.

Festuca procumbens Muhl. Gram. 160. 1817. A prostrate form with longer awns, but the characters are not constant, and it does not seem best to separate this as a species, as is done by Mr. Nash.

Diplachne procumbens Nash in Britton Man. 128. 1901. Transfers *Festuca procumbens* Muhl. There is a South American species by this name, *Diplachne procumbens* Arech. Gram. Urug. 354. 1894.

Leptochloa polystachya Kunth. Rev. Gram. **1**: 91. 1835 (or earlier?). Transfers Michaux's *Festuca polystachya*. Under the rule once a synonym always a synonym the Australian species should receive another name (*Leptochloa polystachya* Benth. Fl. Austr. **7**: 617. 1878). Bentham says (p. 618), "I have been able to retain Brown's specific name, as the American *Diplachne panicularis* [*fascicularis*] named *Leptochloa polystachya* by Kunth is generally retained under the former genus. Syn. *Cynodon polystachya* R. Br. Prod. 187. *C. virgatus* Nees in Steud. Syn. **1**: 213. *C. Neesii* Thw. Enum. Pl. Ceyl. 371."

Diplachne acuminata Nash in Britton Man. 128. 1901. Represented from Nebraska, Rydberg 1713; Arkansas, Coville 87; Colorado, Clements 263.

Uralepsis composita Buckley. Proc. Acad. Phil. **1862**: 94. 1863. "New Mexico. Dr. Woodhouse." I have examined this specimen in the herbarium of the the Academy.

Diplachne tracyi Vasey. Bull. Torr. Bot. Club. **15**: 40. 1888. "In clumps growing in ditches at Reno, Nevada." Tracy No. 216. Dr. Vasey remarks that this is "Near *D. fascicularis*." In the type specimen which is in the herbarium of the Department of Agriculture the lateral nerves are more conspicuously excurrent than is usual in *D. fascicularis*, but there seem to be no constant characters by which this form can be separated. It is a large form, with more exserted panicles, found from Nevada to Mexico, Pringle 813; Palmer 691.

Leptochloa tracyi Beal. Grasses N. A. **2**: 436. 1896. Transfers *Diplachne tracyi*.

Festuca multiflora Walt. Fl. Car. 81. 1788.

"Repens, paniculis erectis ovatis, spiculis 8 ad 40-floris acutis, floris angustis, acutis, fauce subplumosis." This may refer to *L. fascicularis*, but the description is scarcely sufficient. This plant is not represented in Walter's herbarium, which is at the British Museum.

Stems tufted, smooth, 3 to 12 dm. high, erect or procumbent. Leaves narrow, usually involute, 1 to 3 dm. long, 3 to 5 mm. wide; sheaths smooth or slightly scabrous. Panicles from a few cm. to 2 dm. long, more or less included in the upper sheath; branches of panicle few or several and of variable length, in the larger forms as much as 1 dm., appressed or ascending, or at maturity spreading. Spikelets usually somewhat overlapping, 7 to 12 mm. long, 6 to 12 flowered. Empty glumes narrow, acute, lower 2 to 3 mm. long, about one-half the upper; flowering glumes 4 to 5 mm. long, with an awn of variable length, sometimes, especially in the procumbent form, as long as the glume; lateral nerves pubescent below.

DISTRIBUTION: Maryland to Florida and west to South Dakota and New Mexico. *Texas:* Jones 4203; Drummond 387. *Kansas:* Hitchcock 920. *Florida:* Nash 2306. *St. Croix:* Ricksecker 306. *Cuba:* Wright 3822, 3812. *Mexico:* Pringle 813; Palmer 254, 691; Schaffner 683 (*D. procumbens*).

LEPTOCHLOA IMBRICATA Thurb. Bot. Calif. **2**: 293. 1880. "Larkins Station, San Diego County (Palmer No. 404); Fort Yuma (Major Thomas); and through the Gila Valley to the Rio Grande." (Pl. V, fig. 2; text fig. 14.)

Diplachne imbricata Scribn. in Vasey Ill. N. A. Grasses 1^2: No. 42. 1891. Transfers *Leptochloa imbricata* and gives a plate.

Diplachne verticillata Nees & Mey. Nov. Act. Nat. Cur. 19. Suppl. **1**: 158. 1843. (Not *Leptochloa verticillata* Kunth, 1835.) "Ad Copiapo in republica Chilensi, Martio 1831, et ad Aricam Peruviæ." The authors remark that this species differs from *Diplachne virens* of Brazil (presumably *Tridens virens* Nees) and *D. fascicularis* in having the glumes not awned from the apex but very shortly mucronate and from the first in its larger spikelets. I have examined *T. virens* Nees and think it is not identical with *L. imbricata* Thurb.

Leptochloa virletii Fourn. Pl. Mex. **2**: 147, 1886. San Luis de Potosi" (Virl., n. 1404). Type specimen examined at Paris.

Rabdochloa imbricata Kuntze. Rev. Gen. **3**: 788, 1891. Transfers *Leptochloa imbricata* Thurb.

Resembles in habit *L. fascicularis* Gray. The panicle is more oblong in outline, being more compact and with shorter branches, and often dark colored and more exserted. Spikelets also resembling *L. fascicularis*, but the empty glumes are broader and more obtuse, and the flowering glumes are somewhat apiculate but not awned.

FIG. 14.—*L. imbricata.*

DISTRIBUTION: *Arizona:* Palmer 548, 51; Lemmon 360; Vasey 540. *California:* Wright 2118; Coulter 776. *Texas:* Tracy 7367. *Mexico:* Palmer 47, 134, 331, 216, 5; Mearns 2741. *Argentina:* Hieronymus 1088. *Paraguay:* Morong 981.

There is a *Leptochloa verticillata* from the East Indies (Kunth Gram. **1**: 91, 1835. *Eleusine verticillata* Roxb., Hort. Beng. 8. 1814).

Diplachne tarapacarum Philippi from Chili appears to belong here, judging from the specimen in herbarium U. S. D. A. (Anal. Mus. Nac. Chili. Bot. 88. 1891.)

LEPTOCHLOA SPICATA Scribn. Proc. Acad. Sci. Phila., **1891**. 304. 1891. Transfers *Diplachne spicata*. (Fig. 15.)

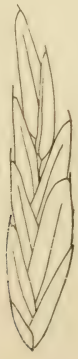

FIG. 15.—*L. spicata.*

Bromus spicatus Nees. Agrost. Bras., 471. 1829. "Habitat in campis, campo mimoso dictis, provinciæ Piauhianæ." Nees observes that in habit this forms a transition to *Brachypodium* or *Agropyron*, but differs in the few nerved glumes; nor does it fit in *Diplachne* any better, since the native species has the glumes not at all apiculate, and foreign species differ much otherwise.

Tricuspis (*Triplasis*) *simplex* Griseb. Mem. Acad. Sci. and Arts. N. Ser. **8**: 532, 1862. Plant. Wright. 2. "In rupibus aridis." Wright, 1551.

Diplachne simplex Doell in Mart. Fl. Bras., 2^3: 97. 1878. "Habitat in prov. Piauhy (Gardner n. 2367)."

Diplachne spicata Doell l. c., 159. 1878. This is a correction. "Pag. 97. Deleatur *Diplachne simplex;* legatur *Diplachne spicata*, ut conservetur nomen specificum."

Triodia schaffneri Wats. Proc. Am. Acad., **18**: 181. 1883. "In the Escabrillos Mountains, San Luis Potosi (1077 Schaffner) closely resembling in habit the Cuban *Tricuspis simplex* of Grisebach and *Diplachne spicata* Doell of Brazil. It is clearly a *Triodia* as the genus is defined by Mr. Bentham."

Diplachne reverchoni Vasey. Bull. Torr. Bot. Club, **13**: 118. 1886. "Collected on granitic rocks, Llano Co., Texas, by Mr. J. Reverchon."

Triplasis setacea Griseb. in Goett. Abhandl., **24**: 304. 1879. Plantæ Lorentzianæ). "Pr. la Merced. S.: ad fl. Juramento." In his remarks upon this species Grisebach says: "Species *T. simplici* Gr. (Pl. Wright. Cub., II. p. 532) proxima."

Stems tufted, slender, 1 to 3 dm. high. Leaves usually about one-half the height of the flowering culm, numerous, narrow, slender, and involute. Inflorescence reduced to a single spike, 5 to 10 cm. long. Spikelets 4 to 7 mm. long, several flowered. Empty glumes acute, flowering glume short awned.

DISTRIBUTION: *Texas:* Reverchon, 1613; Nealley, 78. *Mexico:* Pringle, 3267. *Argentina:* Hieronymus, 337. *Brazil:* Gardner, 2367.

Diplachne loliiformis F. von M. of Australia closely resembles this.

Besides those species mentioned above are three described by Fournier, which I have not seen. Copies of the original descriptions of these are here appended.

LEPTOCHLOA LIEBMANNI Fourn. Pl. Mex., **2**: 147, 1886.

Culmo elato 2–3 pedali, valde ramoso, stramineo, glabro; foliis infra longe vaginantibus mollibus lanceolatis, 4–5‴ latis, ligula fimbriata; panicula longa stricta, radiis appressis, secundifloris; spiculis 4-floris, glumis inæqualibus, inferiore aucta dimidio breviore, superiore obtusa obscure trilobata, lobo medio mucronato; palea exteriore acuta carinata.

Antigua, februario (Liebm., n. 248); absque loco (Liebm., n. 244).

DIPLACHNE PATENS Fourn. Pl. Mex., **2**: 148. 1886.

Culmo a basi ramoso, ramis circulariter ascendentibus glabro, striato, stramineo, nodis brunneis, ligula hyalina acuta sæpe laciniata, foliis longis linearibus angulo recto divergentibus, acutis; panicula invaginata, radiis alternis patulis flexuosis scabris, spiculis 7-floris; gluma inferiore dimidiam superiorem non æquante, exteriore violacea acuminata carinata scabra; rhachi inter flores flexuosa; palea inferiore carinata, nervo medio prominente acuminata, superiore duplo minore, bicarinata, obtusa, apice integra.

Vera Cruz (Gouin, n. 93).

LEPTOCHLOA PANICULATA Fourn. Bul. Soc. Bot. France (ser. 2), **27**: 296. 1880.

Culmo 3-pedali, cum nodis glabro; foliis latis brevibus, acuminatis, ligula brevi laciniata; inflorescentia pedali, axi paniculæ et radiorum scabro; radiis primariis primum patulis, dein divaricatis, in dimidia inferiore parte radiolos semipollicares emittentibus; spiculis 3–4 floris muticis, floribus remotis, glumis æqualibus, palea exteriore bidentata mutica.

Absque loco (n. 1079).

SPECIES EXCLUDED.

LEPTOCHLOA BRANDEGEI Vasey = **GOUINIA BRANDEGEI** Hitchc. (Fig. 16.)

FIG. 16.—*Gouinia brandegei*. Callus on right.

This was first described by Vasey (Proc. Calif. Acad., ser. 2, **2**: 213. 1889). This agrees with the other species of *Gouinia* in habit and in general floral structure, such as the 1-nerved unequal empty glumes, the 3-nerved flowering glume, the rather long-pediceled rudimentary flower, and the hairy callus of the lower flower. It differs from the other species chiefly in the very short awn to the flowering glume.

DISTRIBUTION: *Lower California:* Brandegee 7, 9, 11, 38. *Carmen Island, Mexico:* Palmer, 362.

Leptochloa rigida Munro = *Eragrostis sessilispica* Buckley.

Leptochloa palmeri Vasey ined. = *Gouinia virgata* Scribn.

Leptochloa mexicana Scribn. = *Gouinia mexicana* Scribn.

PLATES.

DESCRIPTION OF PLATES.

PLATE I. Fig. 1.—*Leptochloa mucronata* Kunth. Athens, Ill. The usual form. Fig. 2.—*Leptochloa viscida* Beal. Mexican Boundary Survey, Mearns No. 793.

II. Fig. 1.—*Leptochloa domingensis* Trin. Florida, Simpson. Fig. 2.—*Leptochloa domingensis* Trin. Hidalgo, Tex., Nealley.

III. Fig. 1.—*Leptochloa scabra* Nees. Louisiana, Langlois. This is the specimen upon which was based *Leptochloa Langloisii* Vasey. Fig. 2.—*Leptochloa nealleyi* Vasey. Texas, Nealley. Type specimen.

IV. Fig. 1.—*Leptochloa fascicularis.* The prostrate form that has been named *Diplachne procumbens* Nash. Denver, Colo., Letterman. Fig. 2.—*Leptochloa fascicularis.* The western form which has been named *Diplachne tracyi* Vasey. Reno, Nev., Tracy, 216. Type specimen of *D. tracyi* Vasey.

V. Fig. 1.—*Leptochloa fascicularis* Gray. Sheffield, Mo. Bush No. 804. The ordinary form. Fig. 2.—*Leptochloa imbricata* Thurb. Cultivated in Grass Garden, U. S. Department of Agriculture.

VI. *Leptochloa floribunda* Doell. The cotype of *Diplachne halei* Nash. Louisiana, Hale. A fragmentary specimen, but interesting because of its history.

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FIG. 1.—LEPTOCHLOA MUCRONATA.

FIG. 2.—LEPTOCHLOA VISCIDA.

FIG. 1.—LEPTOCHLOA DOMINGENSIS, FROM FLORIDA.

FIG. 2.—LEPTOCHLOA DOMINGENSIS, FROM TEXAS.

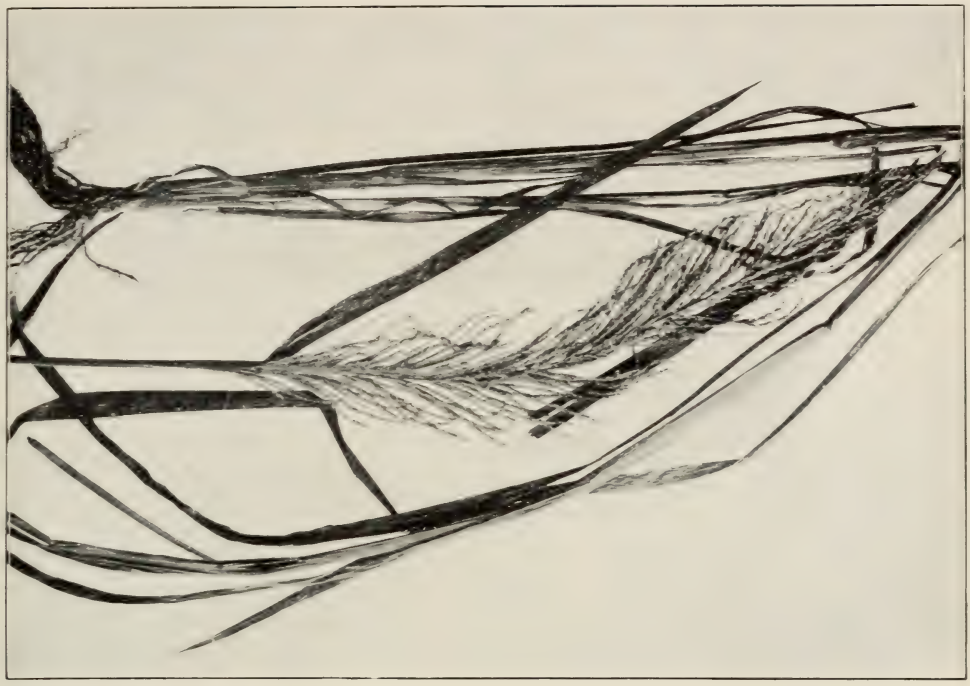

FIG. 1.—LEPTOCHLOA SCABRA.

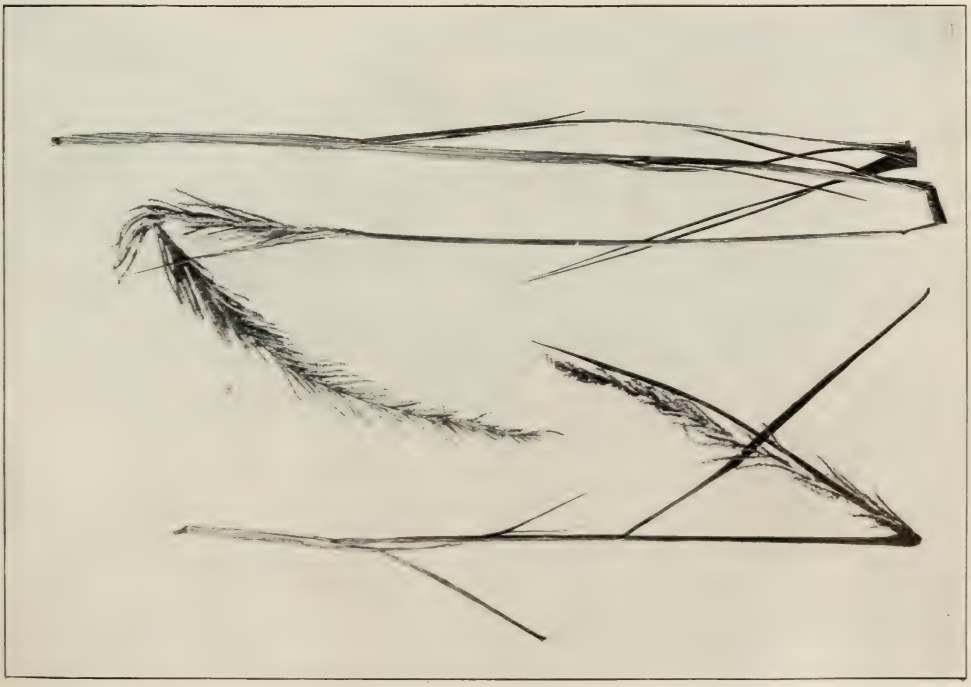

FIG. 2.—LEPTOCHLOA NEALLEYI.

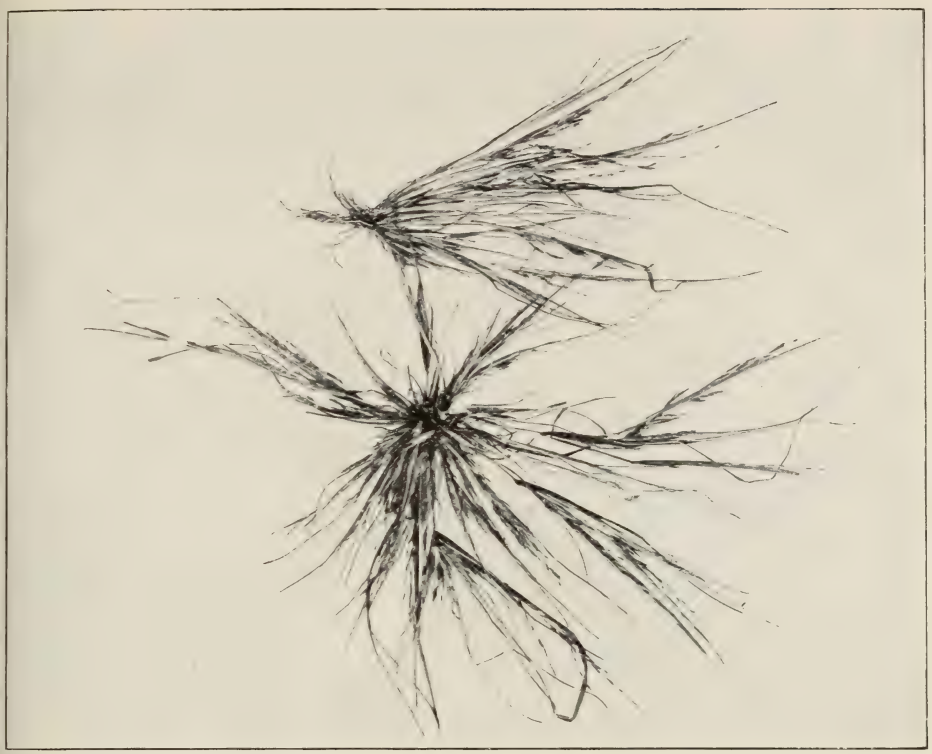

FIG. 1.—LEPTOCHLOA FASCICULARIS (DIPLACHNE PROCUMBENS NASH).

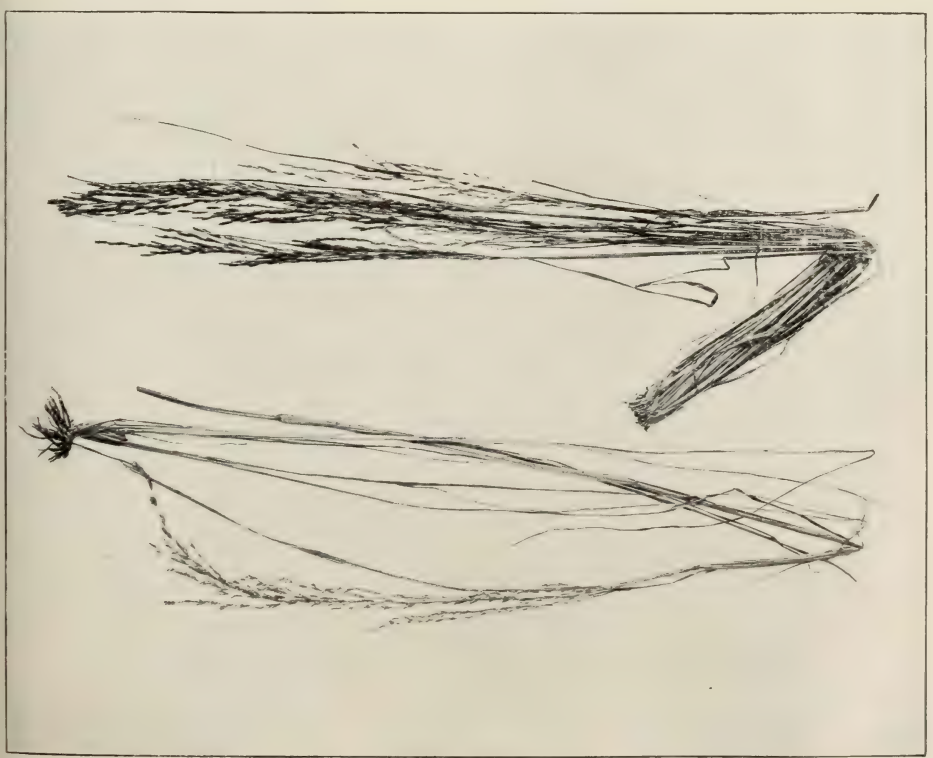

FIG. 2.—LEPTOCHLOA FASCICULARIS (DIPLACHNE TRACYI VASEY).

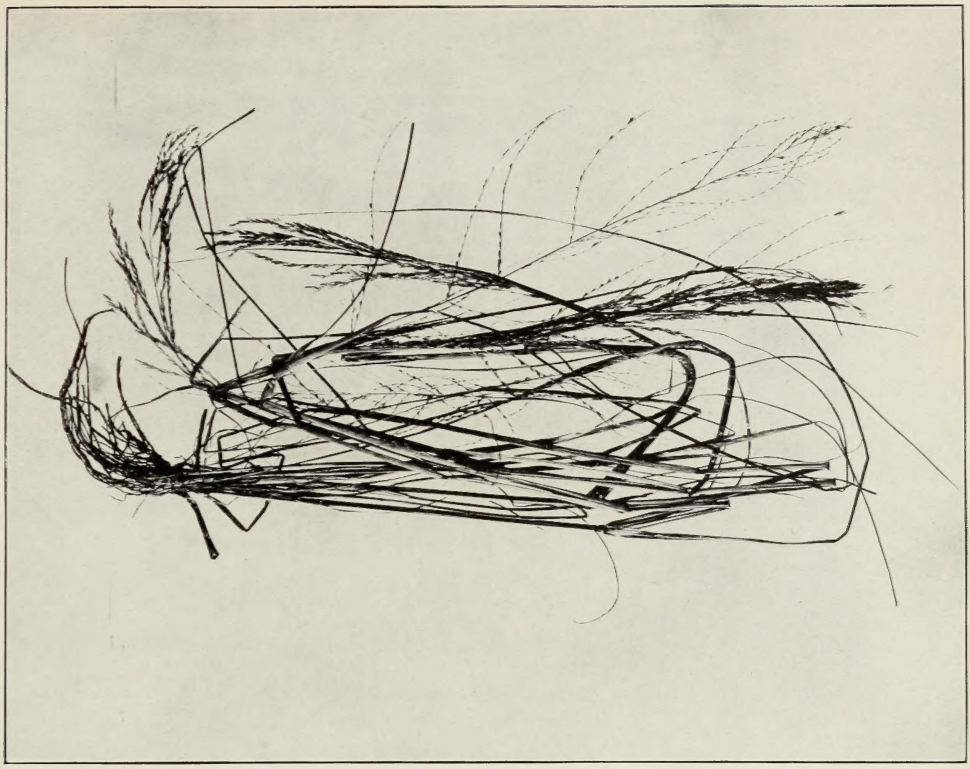

FIG. 1.—LEPTOCHLOA FASCICULARIS (ORDINARY FORM).

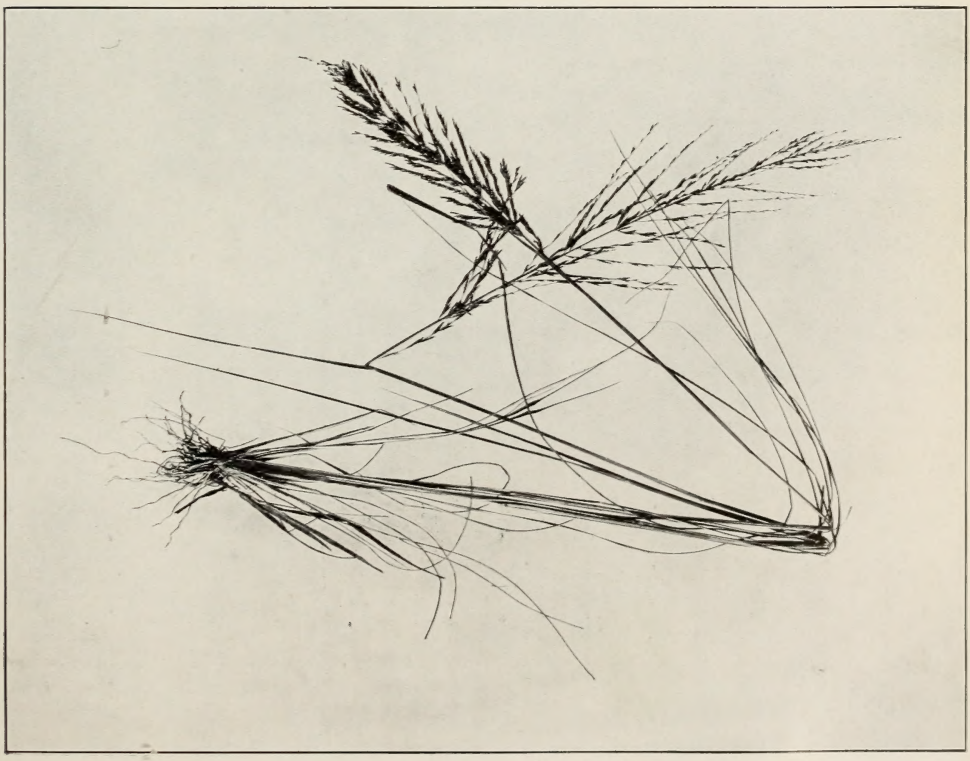

FIG. 2.—LEPTOCHLOA IMBRICATA.

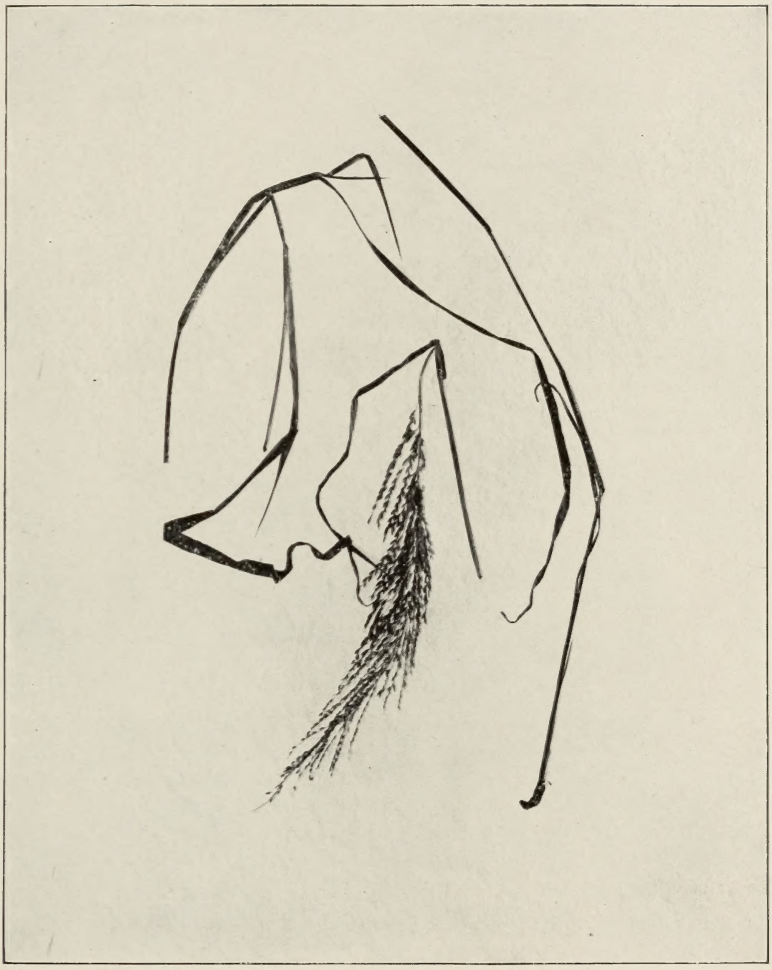

FIG. 1.—LEPTOCHLOA FLORIBUNDA.